



M 21125

Reg. No. :

Name :

**Second Semester M.A./M.Sc./M.Com. Degree (Regular/Supplementary/
Improvement) Examination, March 2012
STATISTICS**

Paper – 2.3 : Design and Analysis of Experiments

Time : 3 Hours

Max. Marks : 70

Instructions : Answer **any five** questions with out omitting **any** Unit.

All questions carry equal marks.

UNIT – I

1. a) State and prove the Gauss Markoff theorem.

b) What are estimable functions ? Consider the following model

$$Y_{ijk} = \mu + \tau_i + \alpha_j + \varepsilon_{ijk} \quad i=1,2, j=1,2, k=1,2 \text{ with } E(\varepsilon) = 0 \text{ and } \text{cov } \varepsilon = \sigma^2 I.$$

Investigate which among the following are estimable functions.

1) $\mu + \tau_i + \alpha_1$

2) $\mu + \alpha_1$

3) μ

4) α_1

5) $\alpha_1 - \alpha_2$

6) $\tau_1 - \tau_2$

2. a) Explain the following terms :

1) Estimation space

2) Error space

3) Estimable functions.

b) For a simple linear regression model derive the form of the t-test for testing

$$H_0 : \beta_1 = 0.$$

UNIT – II

3. a) Derive the analysis of a two-way classification data with multiple but equal number of observations per cell.

b) Obtain the efficiency of a Latin square design relative to (i) CRD (ii) RBD.

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4. a) Distinguish between Latin square design and Graeco-Latin square design. Explain the analysis of variance of a general Graeco-Latin square. Give the method of obtaining the sum of squares and partitioning the degrees of freedom.
- b) With respect to a RBD based on 'b' blocks each of size 'R' derive the details of exact analysis of the design when a single observation is missing.

UNIT – III

5. a) Explain total confounding and partial confounding. A 2^4 factorial experiment is laid out in blocks of size 8 with four replicates write down the break up of the degree of freedom for analysing the results of such an experiment under total confounding.
- b) Write down the layout and analysis of a 3^2 design.
6. a) What is a fractional factorial design ? When do you go for a fractional factorial design ? Give its salient features.
- b) In a 2^6 factorial experiment arranged in 8 blocks each containing 8 plots, the interaction ABCD and AEF are to be confounded. Write down the treatments in the principal block. Explain also how the remaining blocks are generated. Illustrate.

UNIT – IV

7. a) What is an incomplete block design ? Explain when an incomplete block design is i) Connected ii) Balanced.
- b) Define association matrix for a PBIB design with two associate classes. Explain the triangular PBIB design and Latin square type of PBIB design with two associate classes.



8. a) What is balanced incomplete block designs ? If there are v treatments in a BIBD, each replicated 'r' times in 'b' blocks with 'k' treatments per block, each pair of treatments occurring together in λ blocks, show that $bk = vr$ and $\lambda(r - 1) = r(k - 1)$. Is it a necessary and sufficient condition for a BIBD to exists ?
- b) Describe a strip plot design. Give its analysis.

UNIT – V

9. a) Stating an appropriate model for the analysis of covariance for a Latin square design, obtain the analysis of the variance covariance table and carry out the test of equal treatment effects.
- b) What is meant by mixed plot analysis ? Develop the procedure for analysing RBD when two mixed up plots involved belong to the same block.
10. Write short notes on
- a) Split plot designs
 - b) Optimality criteria of BIBD
 - c) Orthogonal designs
 - d) Connected designs.



UNIT – II

- a) Derive the analysis of a two-way classification data with multiple but equal number of observations per cell.
- b) Obtain the efficiency of a Latin square design relative to (i) CRD (ii) RBD.